

5.7 STREAM ZONES, FLOODPLAINS, SHOREZONES, AND GROUND WATER

Stream Environment Zones

An important component of water quality protection programs in the Lake Tahoe Basin is the preservation and restoration of “Stream Environment Zones” (SEZs). Although SEZs are generally synonymous with “wetlands” and “riparian areas” as discussed elsewhere in this Basin Plan, the criteria for field delineation of SEZs, and SEZ control measures, are unique to the Lake Tahoe Basin (and the Tahoe Regional Planning Agency’s “Lake Tahoe Region,” which includes part of the Truckee River watershed). One of the differences between the TRPA and federal criteria is the use of both primary and secondary SEZ indicators in the TRPA system.

The Lahontan Regional Board’s regionwide control measures for protection and restoration of wetlands are discussed in Chapter 4. In the Lake Tahoe Basin, the Regional Board implements discharge prohibitions to protect SEZs; these prohibitions and applicable exemption criteria are discussed in the section of this Chapter on development restrictions.

The dense vegetation of SEZs is capable of rapid nutrient uptake and incorporation, while the moist to saturated soils are conducive to denitrification. Studies of nutrient removal by SEZs (reviewed in the 208 Plan, TRPA 1988, Vol. I) have shown that:

- Sheet flow across SEZs provides the most effective treatment of water
- The natural treatment capability of SEZs is destroyed where development causes channelization, and
- Channelized SEZs may actually increase sediment and nutrient loading in areas where erosion is caused by concentrated flow.

While SEZs have been found to be very effective in removing nutrients and sediment, during certain rainfall and snowmelt episodes, and following the fall die-off of vegetation, SEZs can also act as a source

of nutrients and sediments, especially if they are disturbed. Nevertheless, the effect of an undisturbed SEZ as a sink for nutrients and sediment remains.

In addition to removing nutrients from stormwater, naturally functioning SEZs can reduce flood peaks, diffuse flow, increase evapotranspiration, and increase the retention time of surface water. SEZs also have many other values related to water quality, such as scenic, wildlife, fishery, and vegetation values.

In 1982, following a “threshold study” to evaluate existing environmental conditions, TRPA estimated that 4,376 of the 9,196 acres of SEZs in its jurisdiction had been developed, disturbed or subdivided. In addition to the 9,196 acres of SEZs in the urbanized areas, TRPA reported 15,971 acres existing on public lands. TRPA estimates that development in SEZs has resulted in approximately 10 times the impervious surface coverage that the Bailey coefficients would allow. Because most of the significant SEZ disturbance has occurred in urbanized areas close to Lake Tahoe, the loss of natural treatment capacity for sediment and nutrients in stormwater from these areas, and the consequent increased pollutant loading to Lake Tahoe, is of special concern.

Identification of SEZs and SEZ Setbacks

SEZs are biological communities that owe their characteristics to the presence of surface water or a seasonal high ground water table. Specific criteria for defining SEZs have changed over time; the history of these criteria is summarized in Volume III of the 208 Plan. Current criteria for identification of SEZs and SEZ setbacks are outlined below.

The following criteria are used by both the Regional Board and TRPA. A Stream Environment Zone is determined to be present if any one of the following key indicators is present, or in the absence of a key indicator, if any three of the following secondary indicators are present. Soil types are discussed in Volume I of the 208 Plan. Plant communities are identified in accordance with the definitions and procedures contained in the report entitled *Vegetation of the Lake Tahoe Region, A Guide for Planning* (TRPA 1971).

1. Key Indicators: Key indicators are:

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- (a) Evidence of surface water flow, including perennial, ephemeral, and intermittent streams, but not including rills or man-made channels; or
- (b) Primary riparian vegetation; or
- (c) Near surface groundwater; or
- (d) Lakes or ponds; or
- (e) Beach (Be) soils; or
- (f) One of the following alluvial soils:
 - (i) Elmira loamy coarse sand, wet variant (Ev)
 - (ii) Marsh (Mh).

2. **Secondary Indicators:** Secondary indicators are:

- (a) Designated floodplain
- (b) Groundwater between 20-40 inches
- (c) Secondary riparian vegetation
- (d) One of the following alluvial soils:
 - (i) Loamy alluvial land (Lo), or
 - (ii) Celio gravelly loamy coarse sand (Co), or
 - (iii) Gravelly alluvial land (Gr).

The boundary of a SEZ is the outermost limit of the key indicators; the outermost limit where three secondary indicators coincide; or if Lo, Co or Gr soils are present, the outermost limit where two secondary indicators coincide, whichever establishes the widest SEZ at any point. The outermost boundaries of a stream are the bank-full width of such stream which is defined as the level of frequent high flow, i.e., the level of flood with a recurrence interval of approximately 1.5 years. Other definitions of terms used in the criteria above are given in Table 5.7-1.

Note that SEZs can include bodies of open water as

well as wet meadows without defined stream channels. SEZs are generally identical with Bailey land capability Class 1b lands (see the section of this Chapter on land capability, above). One hundred year floodplains are sometimes, but not always, included within SEZs; see the separate section of this Chapter on 100-year floodplain protection for control measures associated with 100-year floodplains which are not also SEZs.

The SEZ criteria can be compared to the federal definition of wetlands (40 CFR § 110.1[f]). Federal “jurisdictional” wetlands are areas which are:

“inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions [including] playa lakes, swamps, marshes, bogs, and similar areas such as sloughs, prairie potholes, wet meadows, prairie river overflows, mudflats, and natural ponds.”

TRPA's official land capability maps shall be used to identify SEZs initially, but are subject to field verification in every instance. The section of this Chapter on land capability describes procedures for land capability challenges, map amendments, and “man-modified” reclassifications which apply to SEZs.

TRPA requires detailed SEZ mapping as part of the “community plan” process for designated commercial core areas. Community plans must include information on the location, amount, and condition of SEZs. TRPA's plans provide that it shall not approve any community plan or master plan, or commit significant resources to development or restoration in affected watersheds, until maps are prepared and approved which precisely identify the SEZ areas and applicable setbacks for the affected areas and contributing SEZ areas for a reasonable distance upstream.

All new development should be set back from the edge of SEZs to buffer the SEZs from erosion, runoff, alteration, and human activities associated with that development. In addition to preserving the integrity of the SEZ, setbacks preserve the important wildlife and scenic values of the edge zone created by the SEZ and the adjoining vegetation types. The 208 Plan (Vol. I, page 136) provides that buildings, other structures, and land coverage shall be set back from

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SEZs in accordance with the criteria below. TRPA's Ordinance Section 37.3.D provides further direction on use of the allowable base coverage assigned to the setback area.

The width of SEZ setbacks should be related to the sensitivity of the SEZ, particularly in terms of channel types and stability. Broad SEZs surrounding meandering streams, for example, require wider setbacks than narrow SEZs adjacent to deeply incised, V-shaped channels. SEZ setbacks are established in accordance with the following criteria, which are illustrated in Figure 5.7-1:

1. Confined Perennial Stream: When a confined perennial stream is present, the following setbacks are established based on the corresponding slope condition:

(a) Good Slope Condition: When the slope condition is identified as good, the setback is 25 feet from the edge of the SEZ or 15 feet from the edge of a terrace, if present, whichever is less.

(b) Average Slope Condition: When the slope condition is identified as average, the setback is 35 feet from the edge of the SEZ or 20 feet from the edge of a terrace, if present, whichever is less.

(c) Poor Slope Condition: When the slope condition is identified as poor, the setback is 60 feet from the edge of the SEZ or 35 feet from the edge of a terrace, if present, whichever is less.

2. Unconfined Perennial Stream: When an unconfined perennial stream is present, the setback is 50 feet from the edge of the SEZ.

3. Confined Ephemeral or Intermittent Stream: When a confined ephemeral or intermittent stream is present, the following setbacks are established based on the corresponding slope conditions:

(a) Good Slope Condition: When the slope condition is identified as good, the setback is 15 feet from the edge of the SEZ or 10 feet from the edge of a terrace if present,

whichever is less.

(b) Average Slope Condition: When the slope condition is identified as average, the setback is 25 feet from the edge of the SEZ or 15 feet from the edge of a terrace, if present, whichever is less.

(c) Poor Slope Condition: When the slope condition is identified as poor, the setback is 40 feet from the edge of the SEZ or 25 feet from the edge of a terrace, if present, whichever is less.

4. Unconfined Ephemeral or Intermittent Stream: When an unconfined ephemeral or intermittent stream is present, the setback is 25 feet from the edge of the SEZ.

5. Channel Absent: When there is an SEZ present but there is no associated channel identified, the setback is 10 feet from the edge of the SEZ.

SEZ Protection

During development of the land capability system, TRPA and the U.S. Forest Service recognized the importance of protecting SEZs. Bailey (1974) recommended that no more than 1% impervious surface coverage or permanent disturbance be allowed within SEZs. Although early land use plans for the Lake Tahoe Basin endorsed protection for SEZs, protective measures were not strictly enforced until the State Water Resources Control Board adopted SEZ discharge prohibitions discussed earlier in this Chapter in 1980, and TRPA adopted similar land use restrictions in the 1981 208 Plan.

TRPA's Goals and Policies provide that SEZs shall be protected and managed for their natural values, and that ground water development in SEZs shall be discouraged when such development might impact associated plant communities or instream flow. The 208 Plan (Vol. I, page 94) recognizes that, because of their importance to water quality, encroachment on SEZs should be severely restricted, and areas of existing encroachment should be restored wherever possible. These preventative BMPs are cost effective ways to protect water quality.

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The 208 Plan provides that **no** new land coverage or other permanent disturbance shall be permitted in SEZs except for public outdoor recreation projects, for public service facilities, for projects which require access across SEZs to otherwise buildable sites, for new development in man-modified SEZs, and for SEZ restoration and erosion control projects, if certain findings can be made. (See also Section 5.4 “Land Capability” and Section 5.8 “Development Restrictions” for discussions of required exemption findings by the Regional Board and TRPA).

The required findings parallel the USEPA policy for review of proposed wetland disturbance in that avoidance of disturbance through reasonable alternatives is preferable to disturbance with offsite mitigation.

The Regional Board and TRPA exemption findings include requirements for a 1.5:1 restoration offset for new disturbance and development which is permitted in SEZs. Implementation of this offset restoration is expected to help fulfill TRPA's SEZ restoration goals (below) and to provide a margin of safety in the event that restored SEZs are not functionally equivalent to natural SEZs.

Note that the “no new coverage” restriction is more stringent than the original Bailey land capability system, which assigned 1 percent allowable coverage to SEZs. TRPA allows the 1 percent coverage attributable to a SEZ to be transferred for use on non-SEZ land on the same parcel.

Replacement of existing coverage in SEZs may be permitted where the project will reduce impacts on SEZs and will not impede restoration efforts. Existing structures in SEZs may be repaired or rebuilt.

Relocation of coverage in SEZs may be permitted when there is a net benefit to the SEZs. The findings which must be made to permit relocation are summarized in the section of this Chapter on land capability and coverage limits.

Additional restrictions on SEZ disturbance apply to resource management activities such as timber harvest and livestock grazing; see the discussions of these activities elsewhere in this Chapter.

Protection of SEZs is also being achieved through

land acquisition under the California Tahoe Conservancy and U.S. Forest Service Santini-Burton programs (see the discussion of land acquisition programs in Section 5.8 “Development Restrictions”).

In addition to the SEZ protection and restoration programs, TRPA's regional “environmental threshold carrying capacity” standards for the protection of vegetation resources call for the maintenance of existing species richness by providing for the maintenance of nine plant associations, including the deciduous riparian association, the meadow association, and the wetland associations, and require that at least four percent of the total undisturbed vegetation in the Region remain deciduous riparian vegetation. TRPA's wildlife threshold standards state that a non-degradation standard shall apply to significant wildlife habitat consisting of deciduous trees, wetlands, and meadows while providing for opportunities to increase the acreage of such riparian associations.

SEZ Restoration

The 1980 *Lake Tahoe Basin Water Quality Plan* identified SEZ restoration as a “promising additional control measure.” The restoration of disturbed SEZs has been carried out by the U.S. Forest Service as part of its watershed restoration program, by the California Tahoe Conservancy, as part of erosion control projects implemented by local governments, and by private parties as mitigation for specific projects. However, the first comprehensive SEZ Restoration Program was adopted in 1988 as part of the revised 208 Plan.

In 1982, TRPA adopted an “environmental threshold carrying capacity” management standard which directs that agency to:

“...preserve existing naturally functioning SEZ lands in their natural condition and restore 25 percent of the SEZ lands that have been identified as disturbed, developed, or subdivided, to attain a 5 percent total increase in the areas of naturally functioning SEZ lands.”

The 208 Plan (Vol. I, page 135) reflects this restoration goal and also provides that, to restore a portion of the natural treatment capacity lost from disturbance, disturbed SEZs in undeveloped, unsubdivided lands shall be restored.

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Based on then current SEZ maps and estimates of the area of disturbance, TRPA interpreted this standard in 1988 to require restoration of 1,100 acres of SEZ. Volume III of the revised 208 Plan identifies 48 specific restoration projects affecting about 450 acres, which could be carried out by federal, state, or local governments or by private parties seeking credit for mitigation. Twenty-nine of these projects are in California (Table 5.7-2). When they are considered together with already completed restoration work, and with large and small projects still to be carried out on public lands, TRPA estimates that the threshold standard will be attained within the 20-year lifetime of the revised 208 Plan. The Lahontan Regional Board will review, and will consider issuing waste discharge requirements for these projects to ensure that they are properly designed and will not exacerbate adverse water quality impacts (e.g., through excessive fertilizer use). SEZ restoration projects require Regional Board exemptions from the discharge prohibitions.

In addition to the formal SEZ restoration program, SEZ restoration is required as a condition of approval for exemptions from land use and discharge prohibitions for other projects. TRPA's Code of Ordinances also provides incentives for SEZ restoration in the form of "bonus" multifamily residential or tourist accommodation development allocations for developers. (See Section 5.8 "Development Restrictions.")

Where full SEZ restoration is not being proposed, BMPs should be used to reduce the impacts of existing development on SEZs and their water quality-related functions. For example, the 208 Plan (Vol. I, page 136) states that golf courses in SEZs shall be encouraged to redesign layouts and modify fertilization to prevent the release of nutrients to adjoining ground and surface waters. Specific measures which can be used to protect and enhance disturbed SEZs are discussed later in this Chapter in connection with specific problem sources such as livestock grazing.

The 208 Plan directs TRPA to develop an implementation program and establish an annual tracking system for SEZ restoration. TRPA recognizes that restored SEZs may or may not perform the same water quality functions as an

undisturbed SEZ. The contribution to water quality management of a restored SEZ will depend upon its location, the nature of the restoration and long-term maintenance of the site.

TRPA expects to carry out a detailed re-mapping of SEZs and 100-year floodplains in the Lake Tahoe Basin using the SEZ criteria in the 208 Plan. TRPA has made a commitment to update and refine the SEZ restoration program as a result of this re-mapping. Current priorities for projects identified in 208 Plan Volume III are based on watershed conditions and consequent ability to deliver sediment and nutrients to Lake Tahoe.

Issues to be addressed in the projected update and refinement of the SEZ Restoration Program include:

1. classification and mapping of stream reaches according to their stability classification
2. matching restoration methods and disturbed reaches based on their stability classification
3. identification of major problem areas and project sites for use in the community planning process, public works planning and other programs
4. development of guidelines for planning and designing SEZ restoration projects
5. integration of SEZ mapping for purposes of identification, restoration and flood hazard determination, and
6. establishment of a scientific and technical advisory committee to guide the SEZ restoration program.

The Regional Board recommends that further updates to the SEZ restoration program include development of scientific criteria for measurement of the adequacy of restoration in terms of restoration of natural SEZ functions, including water quality protection. There is a growing body of literature on the adequacy of wetland restoration (e.g., National Research Council 1992; see the discussion in Chapter 4 of this Basin Plan). This literature supports restoration ratios up to 10:1 in certain circumstances.

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SEZ Creation

The potential also exists for creation of new SEZs, or expansion of the boundaries of existing SEZs in the Lake Tahoe Basin to increase the potential for stormwater treatment. A few small wetlands have already been created in associations with specific Tahoe Basin projects. As for wetlands restoration, scientific criteria are being developed for wetlands creation (Costlier and Candela 1990), and many of the same concerns about development of natural wetland functions apply. The Regional Board generally encourages additional SEZ creation in the Lake Tahoe Basin, but the impacts of each proposal on water quality and beneficial uses must be carefully evaluated. For example, a water diversion to support a created SEZ could adversely affect beneficial uses at the diversion site.

Created wastewater treatment wetlands designed, built, and operated solely as wastewater treatment systems are generally not considered to be waters of the United States (USEPA 1988). Water quality standards that apply to natural wetlands generally do not apply to such created wastewater treatment wetlands. However, many created wetlands are designed, built, and operated to provide, in addition to wastewater treatment, functions and values similar to those provided by natural wetlands. Under certain circumstances, such created multiple use wetlands may be considered waters of the U.S. and applicable water quality standards would apply. The applicability of water quality standards to created SEZs/wetlands will be determined by the Regional Board on a case-by-case basis. In its determination, the Regional Board will consider factors such as size, location, type of waste to be treated, degree of isolation of the created wetlands, and other appropriate factors. Any discharge from a created wetland which does not qualify as "waters of the U.S." must meet applicable water quality standards of its receiving water(s).

It is probable that most larger created SEZs (e.g., areawide stormwater treatment systems) in the Lake Tahoe Basin will be multiple use systems which will be considered waters of the State and of the U.S.

Floodplain Protection

Flooding in the Lake Tahoe Basin results from rapid surface water runoff from rainfall, snowmelt, or both, that exceeds the capacity of the natural and

manmade drainage systems. Localized flooding occurs throughout the urbanized areas of the Lake Tahoe Region, but is most prevalent in low-lying areas of the south shore, with its broad alluvial plain. Flooding from seiche (abnormally large waves generated by earthquakes or landslides) is also possible in the shorezone of Lake Tahoe and other lakes in the Region.

As noted in Chapter 4 of this Basin Plan, development in floodplains contributes to water quality problems as well as exposing people and property to flood hazards. In addition to providing natural treatment capacity for water pollutants, undisturbed floodplains reduce the intensity of downstream flows, and thus the potential for streambank erosion. In developed floodplains, flood waters can also adversely affect water quality by rupturing sewer lines, and mobilizing stored toxic substances.

Control Measures for Floodplain Protection

This Basin Plan includes Regional Board discharge prohibitions to protect 100-year floodplains in the Lake Tahoe Basin and the Truckee River watershed which are separate from the prohibitions for protection of Stream Environment Zones (SEZs).

The criteria for definition of SEZs, outlined in the previous section of this Chapter, include 100-year floodplains as secondary indicators, but unless other indicators are also present, a 100-year floodplain is **not** automatically considered to be a SEZ. When a 100-year floodplain **is** considered a SEZ, the SEZ exemption criteria in the section of this Chapter on development restrictions apply. TRPA (208 Plan, Vol. I, page 132) has land use restrictions against construction within 100-year floodplains, and has adopted a set of floodplain exemption criteria, which are very similar to the SEZ exemption criteria, for projects in floodplains which are not also SEZs. These TRPA criteria were modified by Regional Board staff to derive the exemption criteria below. TRPA applies its floodplain exemption criteria in the portion of the Truckee River corridor within its jurisdiction, but the Regional Board applies separate 100-year floodplain exemption criteria for the Truckee River HU (see the section of this Chapter on discharge prohibitions).

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The Lahontan Regional Board may grant exceptions to the 100-year floodplain discharge prohibitions for Lake Tahoe and its tributaries, in cases where the floodplain is not also a Stream Environment Zone, only under the following circumstances:

1. For public outdoor recreation facilities if: (a) the project is a necessary part of a public agency's long range plans for public outdoor recreation; (b) the project, by its very nature, must be sited in a floodplain; (c) there is no feasible alternative which would reduce the extent of encroachment in a floodplain, and (d) the impacts on the floodplain are minimized. In determining whether the project "by its very nature" must be sited in a floodplain, the Regional Board should use the guidelines for SEZ projects in Table 5.7-3;
2. For public service facilities if: (a) the project is necessary for public health, safety, or environmental protection, (b) there is no reasonable alternative, including spans, which avoids or reduces the extent of encroachment in a floodplain, and (c) the impacts on the floodplain are minimized;
3. For projects which require access across floodplains to otherwise buildable sites if: (a) there is no reasonable alternative which avoids or reduces the extent of encroachment in the floodplain and (b) the impacts on the floodplain are minimized; and
4. For erosion control projects, habitat restoration projects, SEZ restoration projects and similar projects provided that the project is necessary for environmental protection and there is no reasonable alternative which avoids or reduces the extent of encroachment in the floodplain.

Under limited circumstances, the Regional Board may delegate authority to the Executive Officer to grant exemptions from the floodplain prohibitions.

In evaluating proposed measures to "minimize" impacts for floodplain projects, the Regional Board should use the regionwide criteria in Chapter 4 in addition to conducting an independent review of TRPA's proposed mitigation conditions.

In evaluating proposed exemptions to discharge

prohibitions for environmental protection projects which are related to protection or enhancement of parameters other than water quality and beneficial uses (e.g., transportation, noise, energy conservation) the Regional Board should give the highest priority to water quality protection.

All public utilities, transportation facilities, and other necessary public uses located in the 100-year floodplain must be constructed and maintained so as to prevent damage from flooding and not to cause flooding.

In remote locations and other locations where 100-year floodplain maps have not yet been prepared by TRPA, the U.S. Army Corps of Engineers, the U.S. Geological Survey, or the Federal Emergency Management Agency (FEMA), and where there is reason to believe that a flood hazard may exist, the Regional Board will require project applicants to accurately delineate the 100-year floodplain in their applications for waste discharge permits.

Floodplains may occur on land capability classes other than Class 1b. Therefore, the base allowable coverage on parcels in the 100-year floodplain but not in SEZs is generally greater than if the parcel were SEZ. This coverage cannot be applied within the floodplain except where TRPA finds it to be consistent with its regional land use plan's Goals and Policies, but it can be transferred to another parcel or another part of the same parcel outside of the floodplain (see the discussion of coverage transfer in the section of this Chapter on land capability and coverage rules).

TRPA projects that some encroachment into 100-year floodplains may occur under the 208 plan. This encroachment may reduce the ability of a given SEZ to convey flood flows and expose physical improvements to flood damage, because the required offset may take place in a different watershed. TRPA expects SEZ restoration programs to provide a general offset for such impacts (208 Plan, Vol. I, page 333).

The Regional Board's 100-year floodplain prohibitions for the Lake Tahoe HU also apply to the area below the high water rim of Lake Tahoe, which corresponds to part of the area which TRPA considers "shorezone." TRPA's development

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restrictions and exemption findings for 100-year floodplains do not apply to the shorezone of Lake Tahoe, except where the project site is determined to be within the 100-year floodplain of a tributary stream. Instead, TRPA uses the shorezone provisions of its Code of Ordinances. See the following section on "Shorezone Protection" for findings which must be made by the Regional Board to approve exemptions to the floodplain discharge prohibitions for projects affecting the "shorezone" of Lake Tahoe.

Shorezone Protection

The littoral (nearshore) areas of lakes are often the most biologically productive. Warmer temperatures and penetration of light to the bottom encourage plant growth which in turn supports invertebrates and fish. Littoral areas are often very important for fish spawning and the early life-cycle stages of young fish. Human activities in and near the littoral zone can physically alter fish habitat and contribute nutrients leading to eutrophication and the alteration of food webs. Rocky shorezones are generally considered better fish habitat than sandy or silty areas; erosion and sedimentation can degrade habitat quality. Lakeshore areas near tributary stream deltas are important "staging areas" for lake fish which migrate up the streams to spawn. Increased growth of attached algae and rooted plants in the shorezone is the most visible sign of eutrophication to human recreational users of lakes.

Piers, marinas, buoys, breakwaters, floating docks, and jetties are found in the nearshore of Lake Tahoe, along with most "prime fish habitat." Prime fish habitat consists of areas of rock, rubble, or cobble substrates which provide suitable conditions to support prey organisms and spawning. The shorezone is also particularly attractive to many species of wildlife, including bald eagles, ospreys, and waterfowl. TRPA has adopted regional "environmental threshold carrying capacity" standards for the protection of nearshore fish habitat and wildlife, including waterfowl habitat.

Fish habitat maps have been adopted as part of TRPA's regional land use plan (TRPA 1987). These maps, and the habitat classifications used, differ somewhat from the maps and habitat classifications derived from a joint study by the U.S. Fish and

Wildlife Service, the California Department of Fish and Game, and the Nevada Department of Wildlife (see the separate discussion on piers in this Chapter).

In 1982, much of the fish habitat in Lake Tahoe rated "good" under the TRPA system experienced moderate to heavy boat traffic, contributing to the decrease in its rating from "excellent" to "good." Siltation and alteration of the lake bottom also contribute to degraded lake habitat.

Shoreline erosion and sediment transport are natural processes, which contribute to beach replenishment; their interruption can result in beach erosion and deep water beaches. Human activities can accelerate shoreline erosion. Tributary streams can create barrier beaches which protect backshore areas from wave action. Encroachment on delta areas can interrupt barrier beach formation and create severe backshore erosion, liberating stored sediment and nutrients. Unnatural fluctuations in lake level may also contribute to water quality problems, eroding large quantities of sediments and nutrients from the shoreline. A dam at the outlet of Lake Tahoe has regulated its maximum level at 6229.1 feet above mean sea level (6.1 feet above the natural level) since 1934.

Shorezone disturbance has the potential to jeopardize the survival of the endangered plant species Tahoe yellow cress, *Rorippa subumbellata*, which is currently found only in the shorezone of Lake Tahoe.

The shorezone of Lake Tahoe is especially vulnerable to the impacts of development, recreation, and underwater construction activities to support recreation (see the separate section of this Chapter on impacts of and control measures for water quality problems related to boating). The following is a general discussion of shorezone protection programs.

Control Measures for Shorezone Protection

Regional Board staff participate in the interagency review process for proposed projects in the shorezone of Lake Tahoe, and may draft waste discharge requirements if necessary to protect water quality. (See the section of this Chapter on recreation

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for more information on Regional Board regulation of dredging and construction in Lake Tahoe.) The prohibitions against discharges and threatened discharges within 100-year floodplains or below the high water rim of Lake Tahoe apply to portions of the shorezone. In order to improve coordination of Regional Board regulation of shorezone projects with that of TRPA and other agencies, this Basin Plan provides the following direction for the Board, its staff, and the regulated community:

- California Environmental Quality Act environmental documents and reports of waste discharge for shorezone projects should address compliance with all of TRPA's water quality related shorezone development standards. Conditions in waste discharge permits should reflect these standards.
- In processing waste discharge permits for shorezone projects, Regional Board staff should independently evaluate technical data collected for field verifications of shorezone tolerance district classifications, challenges of such classifications, shorezone district map amendments, and "man-modified" reclassifications.
- Before approving exemptions from discharge prohibitions for projects proposing the creation of new land coverage or permanent disturbance in the backshore of Shorezone Tolerance District 1 lands, or for projects proposing replacement of existing coverage in the backshore of Shorezone Tolerance District 1 lands, the Regional Board must make the SEZ exemption findings set forth elsewhere in the section of this Chapter on development restrictions.
- Before approving projects below the high water rim of Lake Tahoe or its tributaries, in areas which are not also considered SEZs, the Regional Board must make the 100-year floodplain exemption findings set forth in the section of this Chapter on 100-year floodplain protection.
- The Regional Board must make separate "man-modified" findings before issuing waste discharge permits and/or exemptions to discharge prohibitions for any shorezone project involving a

TRPA "man-modified" reclassification of a shorezone tolerance district.

Under limited circumstances, the Regional Board may delegate authority to the Executive Officer to grant exemptions from the discharge prohibitions applicable to shorezone development.

The Tahoe Regional Planning Agency's regional land use plan (TRPA 1987) has a special set of goals, policies, and ordinances regulating shorezone activities at Lake Tahoe and other lakes within its jurisdiction (TRPA 1987). The 208 Plan incorporates key provisions of these Regional Plan components. The TRPA shorezone ordinances (Chapters 50 through 56) establish detailed shorezone standards regarding project review, permissible uses and accessory structures, existing structures, Shorezone Tolerance Districts and development standards, development standards lakeward of high water, development standards in the backshore, and mitigation requirements.

TRPA divides the "shorezone" into the backshore, foreshore, and nearshore. The backshore extends from the high water level to the area of wave runup or "area of instability," plus ten feet. (The area of instability may be determined based on a geotechnical report, or through calculations based on the height of a bluff, as described in TRPA's Ordinance Chapter 55.) The foreshore is the area of lake level fluctuation between the high and low water level. The nearshore of Lake Tahoe extends lakeward from the low water elevation to a depth of 30 feet, or to a minimum width of 350 feet. In other lakes within TRPA's jurisdiction, the nearshore extends to a depth of 25 feet below the low water elevation.

TRPA has established a "Shorezone Tolerance District" system, independent of the land capability system, which defines tolerance districts on the basis of soils and slope characteristics, the potential for shoreline or cliff erosion and their sensitivity to disturbance (Table 5.7-4). Shorezone Tolerance District maps have been adopted as part of TRPA's land use plan (TRPA 1987), and TRPA's Code of Ordinances establishes procedures for field verification of shorezone classifications, challenges of classification, map amendments, and "man-modified" reclassifications which are similar to those applicable

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to the Bailey land capability system (see the section of this Chapter on land capability).

Because TRPA now regulates most of the shorezone under the Shorezone Tolerance District system and shorezone ordinances rather than the land capability system, the TRPA's land use exemption criteria for SEZ projects do not automatically apply. As noted in Table 5.7-4, TRPA applies its SEZ regulations, including exemption criteria, to new development and replacement of existing land coverage in the backshore of Shorezone Tolerance District 1.

Development Standards

Construction of man-made lagoons connected to any lake in the Tahoe Region, not including existing marinas and modifications thereto, and construction of artificial islands, are prohibited by the 208 Plan (Vol. I, page 155).

The 208 Plan provides that all vegetation at the interface of the backshore and foreshore shall remain undisturbed unless disturbance is permitted for uses otherwise consistent with the shorezone policies. The interface includes backshore cliffs and other unstable lands influenced by littoral or wave processes. The use of lawns and ornamental vegetation in the shorezone shall be discouraged. Plant species approved by TRPA shall be selected when revegetating disturbed sites.

TRPA has targeted for restoration the shorezone fish habitat adjoining 24 of 29 of its "plan areas" where degraded habitat has been identified. Under TRPA's ordinance Chapter 79, projects and activities in the shorezones of lakes may be prohibited or otherwise regulated in prime fish habitat areas, or in other areas TRPA finds to be vulnerable or critical to the needs of fish. Certain activities (e.g., construction) may be restricted in areas where spawning is occurring.

The 208 Plan (Vol. I, page 155) provides that TRPA shall regulate the placement of new buoys, piers and other structures in the foreshore and nearshore to avoid degradation of fish habitat and interference with littoral drift, and further provides that TRPA will require mitigation for all impacts. TRPA shall regulate the maintenance, repair, and modification of piers and other structures in the nearshore and foreshore. Retention of a natural buffer to minimize impacts of backshore development is preferred over engineering solutions to backshore instability.

Construction activity should be set back to ensure no disturbance of the interface between high capability backshore and cliff areas.

Requirements for application of BMPs to new projects, and retrofit of BMPs to existing projects, and TRPA's enforcement program, apply to shorezone lands as they do to all other lands in the Region.

The BMP Handbook (TRPA 1988, Vol. II) includes special construction techniques and development criteria applicable to the shorezone. Implementation of shorezone BMPs and vegetation policies will have a positive effect on the stability and integrity of the shorezone. Proper construction techniques and other measures will be required to mitigate activities in the shorezone and to protect the natural values of the shorezone.

The protection of stream deltas is important to the stability of the shorezones of lakes in the Tahoe Region. Stream deltas shall be protected from encroachment and disturbance as described under the Stream Environment Zone protection provisions. Protection of stream deltas preserves the natural balance between the erosive forces of winds and waves and the protection provided by barrier beaches. (Related needs for protection of stream inlets are discussed in the section of this Chapter on piers.) The 208 Plan protects stream deltas through restrictions on SEZ and shorezone encroachment and vegetation alteration, and restrictions and conditions on filling and dredging (Vol. VI, page 108).

The following general TRPA development standards (TRPA 1987, Code of Ordinances) related to water quality protection also apply to all shorezones, including those of the "other lakes" than Lake Tahoe where development is permitted (see the separate "Protection of Lakes" section, below):

Chapter 50 provides that a project in the shorezone or lakezone shall not be approved unless TRPA finds that:

- The project will not adversely impact littoral processes, fish spawning, backshore stability, or onshore wildlife habitat, including wildfowl nesting habitat
- There are sufficient accessory facilities to

accommodate the project

- The project is compatible with existing shorezone and lakezone uses or structures on, or in the immediate vicinity of, the littoral parcel, or that modifications of such existing uses or structures will be undertaken to assure compatibility
- The use proposed in the foreshore or nearshore is water-dependent
- Measures will be taken to prevent spills or discharges of hazardous materials
- Construction and access techniques will be used to minimize disturbance to the ground and vegetation
- The project will not adversely impact navigation or create a threat to public safety as determined by those agencies with jurisdiction over a lake's navigable waters, and
- TRPA has solicited comments from those public agencies having jurisdiction over the nearshore and foreshore, and all such comments received were considered by TRPA prior to action being taken on the project.

Table 5.7-4 lists special TRPA development standards for each of the shorezone tolerance districts.

TRPA's ordinances provide for the removal or modification of existing shorezone structures which are non-conforming with development standards and which interfere with navigation or have impacts on the shoreline.

In addition to review by the Lahontan Regional Board and TRPA, shorezone development or disturbance in the California portion of the Lake Tahoe Basin may also require permits from the U.S. Army Corps of Engineers, the California State Lands Commission, and the Department of Fish and Game. These agencies coordinate their regulatory activities through periodic shorezone development review committee meetings. As discussed elsewhere in this Basin Plan, State water quality certification under Section 401 of the Clean Water Act is necessary for Corps of

Engineers permits. The State Lands Commission, which manages state-owned lands under Lake Tahoe and its tributaries, and in the shorezone, implements the Public Trust Doctrine (see Chapter 1) in its permitting process; it also implements a special program for the protection of the endangered Tahoe yellow cress.

Additional control measures affecting piers and marinas are discussed in the section of this Chapter on recreation.

Section 401 and 404 Permits

As discussed in Chapter 4 of this Basin Plan, Section 401 of the federal Clean Water Act requires state "water quality certification" for certain types of permits granted by federal agencies such as the Federal Energy Regulatory Commission (FERC) and the U.S. Army Corps of Engineers. In some cases the State Board handles Section 401 certifications directly, and in some cases it delegates authority to the Regional Boards. Applicants for Section 401 certification for Lake Tahoe Basin projects should contact Regional Board staff for information on current certification procedures.

Section 404 of the Clean Water Act requires permits from the U.S. Army Corps of Engineers for dredge and fill activities in "waters of the United States," which include essentially all surface waters and "jurisdictional wetlands" in the Lake Tahoe Basin. In order to simplify its permitting process, the Corps has issued a variety of "nationwide permits" for certain types of activities. To be effective in California, the Corps nationwide permits require Section 401 certification by the State Board. Following the direction of the 1980 *Lake Tahoe Basin Water Quality Plan*, the State Board has **not** certified nationwide permits for dredge and fill activities in the waters of the Lake Tahoe Basin under Section 26 applicable to "headwaters." Thus, individual Corps permits are required for construction and dredging in Lake Tahoe and its tributaries, including wetlands and many SEZs.

Protection of Lakes and Streams Tributary to

Lake Tahoe

Relatively little quantitative information is available on the quality of most tributaries to Lake Tahoe. However, the control measures designed to protect and enhance Lake Tahoe should also protect tributary lakes and streams.

The Lake Tahoe Basin includes about 170 lakes and ponds other than Lake Tahoe, most of which are in California. Many of these are within the Desolation Wilderness or in National Forest lands managed for dispersed recreation use, and the major threats to water quality are from human wastes and watershed disturbance due to recreational overuse (see the section of this Chapter on control of recreational impacts). Several of the larger lakes have residential or recreational development within their watersheds (Fallen Leaf, Cascade, and Upper and Lower Echo Lakes). Threats to water quality of tributaries of Lake Tahoe include nutrients from past use of septic systems, watershed disturbance, stormwater runoff from roads and parking areas, livestock grazing, and vessel wastes. Taste and odor problems have been reported in water supplies from Fallen Leaf Lake; they appear to be associated with blooms of an algal species usually associated with eutrophic conditions. TRPA now coordinates monitoring of and reporting to the State Board on a number of lakes other than Lake Tahoe, and has recommended that a nitrogen study of the Echo Lakes be conducted before future development is permitted there. The U.S. Forest Service is also monitoring water quality in a Desolation Wilderness lake to determine the impacts of atmospheric deposition.

Development around Fallen Leaf Lake has been sewered. Development near other larger lakes discharges toilet wastes to holding tanks; greywater discharges to leachfields are permitted in some circumstances (see the section of this Chapter on wastewater treatment, export, and disposal). The Regional Board should continue to review monitoring data for these lakes to determine the need for further controls on wastewater.

Problems affecting streams tributary to Lake Tahoe, and their beneficial uses (including fish habitat) include siltation, channelization, dredging, removal of rock or gravel, culverts, bridges, diversions, urban runoff, snow disposal and littering. Stream flows for fish habitat may be endangered by diversions for

domestic use, irrigation, and snowmaking.

Streams themselves are included in the definition of the term "Stream Environment Zone," and all of the SEZ protection measures discussed in this Chapter apply. TRPA has adopted a regionwide "environmental threshold carrying capacity" standard of 60 mg/l suspended sediment for tributary streams, which applies in addition to the state water quality objectives set forth earlier in this Chapter. TRPA has also set regional "threshold" standards for fish habitat, requiring the upgrading of specific amounts of stream mileage from "marginal" to "good" and from "good" to "excellent"; the thresholds also require nondegradation of instream flows pending adoption of instream flow standards. The thresholds also state that it is TRPA's policy to support, in response to justifiable evidence, state and federal efforts to reintroduce the Lahontan cutthroat trout (see the fisheries management section of Chapter 4). The 208 Plan (Vol. I, page 323) does not permit modifications to stream channels and other activities that may physically alter the natural characteristics of a stream, unless TRPA finds that they avoid adverse effects to fish or are otherwise allowed under TRPA's Code of Ordinances. TRPA requires development adjacent to tributaries to fully mitigate adverse impacts to the fishery.

The control measures discussed throughout this Chapter, which are implemented by the Regional Board, TRPA, and other agencies, will protect the tributaries of Lake Tahoe as well as the lake itself. See especially the sections on SEZs, shorezone protection, and 100-year floodplain protection.

Ground Water Protection

Although data are limited, research to date indicates that ground water nutrient loading represents a substantial contribution to Lake Tahoe. Loeb (1987) found ground water concentrations of nitrate in three watersheds to be lowest (by a factor of two to ten) in areas farthest upgradient from Lake Tahoe and to increase downgradient toward the lake. This corresponds to the degree of land disturbance. Urbanization can significantly increase nitrate concentration in ground water through fertilizer addition, irrigation, sewer line exfiltration, sewage spills, infiltration of urban runoff, and leachate from abandoned septic systems. Future development will

5.7, Stream Zones, Floodplains, Shorezones, and Ground Water

increase nutrient transport in ground water by removing vegetation which normally recycles nutrients in the watershed. Although ground water disposal of stormwater is generally preferable to surface discharge because it provides for prolonged contact with soils and vegetation which remove nutrients, infiltration of urban stormwater in areas with high groundwater tables may be undesirable because of possible contamination of drinking water supplies from toxic runoff constituents.

In addition to contributing nutrients, human activities in the Lake Tahoe Basin have led to localized ground water contamination through leaks, spills, and illegal disposal of fuels and solvents. The impacts of infiltration of stormwater containing petroleum products, heavy metals, and deicing chemicals on ground water quality at Lake Tahoe have not been well studied, but are of concern. Local naturally high concentrations of uranium and arsenic in groundwater have also limited the use of some potential municipal supplies. Because of these problems, and because total consumptive use of surface and ground water in the Tahoe Basin is limited by interstate agreement, it is important to protect the remaining good quality ground water for municipal use.

Control Measures for Ground Water Protection

Further increases in nutrient concentrations in Tahoe Basin ground waters can be prevented through control measures discussed elsewhere in this Chapter, including use of alternatives to infiltration in areas with high ground water, fertilizer management, maintenance and upgrading of sewer systems, and vegetation protection and revegetation of denuded areas. Because ground water tables are often very near the surface in Stream Environment Zones, protection of SEZs will also protect ground water quality.

Many of the control measures needed to control erosion and surface runoff are also needed to protect ground water. In addition, some of the Best Management Practices set forth in the 208 Plan (Vol. II) are specifically directed to preventing discharges to ground water. For example, the BMP for livestock confinement facilities (BMP 79) provides that they shall not be located in areas with less than 4 feet

between the soil surface and the ground water table at any time of the year. The surface and ground water systems of the Lake Tahoe Basin are interconnected, and the control measures are directed towards protecting both.

Programs used to control surface runoff will incorporate measures to protect ground water. The prohibitions adopted to prevent development which threatens water quality include prohibitions against discharges to ground water. The limitations on vegetation removal set to prevent erosion from timber harvesting, ski areas, and other sources will also help protect ground water. Programs to enforce BMPs at sites with onsite surface water problems will also incorporate those Best Management Practices adopted to protect ground water.

Controls on solid waste disposal and on toxic leaks and spills (discussed elsewhere in this Chapter, and in greater detail in Chapter 4) will also protect ground water quality in the Lake Tahoe Basin. Because redevelopment of existing urban areas is expected to be an important component of future development in the Basin, Regional Board staff should continue to cooperate with local governments in identification of soil and ground water contamination from past development, and in requiring cleanup of identified problems before new development takes place.